REVUE SUISSE DE ZOOLOGIE 867
Tome 65, nº 42. — Décembre 1958.

Some Tetraphyllidea (Cestoda) from the Liverpool School of Tropical Medicine

by

H. Harford WILLIAMS

Institut de Zoologie, Université de Neuchâtel.
Directeur: Professeur Jean-G. Baer.

With 19 figures in the text.

INTRODUCTION

In April 1956 Professor J. G. Baer obtained the loan of a collection of Cestoda including Southwell's Tetraphyllidea from the Liverpool School of Tropical Medicine with the intention of re-examining and redescribing the species. A very small part of the collection has been investigated by the writer. This includes five species of the genus *Rhinebothrium* Linton, 1890, one of which is new, and a species of *Caulobothrium* Baer, 1948. It was considered advisable to publish the results of the investigation as most of the specimens examined had originally been determined incorrectly as species of the genus *Echeneibothrium* Beneden, 1850 in which the scolex possesses an apical myzorhynchus. This structure, however, is absent in all the specimens examined and they are, therefore, included either in *Rhinebothrium* or *Caulobothrium*, two genera which differ in the form of the scolex and in the extent of the testes. In *Rhinebothrium* a cephalic peduncle, that is a posterior extension of the scolex, is always absent but it is a distinctive feature of *Caulobothrium*. In the latter there are testes between the cirrus pouch and the ovary on the side of the genital pore but they never occupy this position in *Rhinebothrium*. The material was in the form of stained whole mounts, the relevant data on the slides being given at the beginning of each of the following descriptions.

Rhinebothrium flexile Linton, 1890.

Synonymy: *Echeneibothrium flexile* Southwell 1925 *pro parte nec* Linton 1890.
Host: *Trygon sp.* and *Dasybatis sp.*
Locality: Pearl bank and Pedro bank, Ceylon.
Date: 24.9.28.

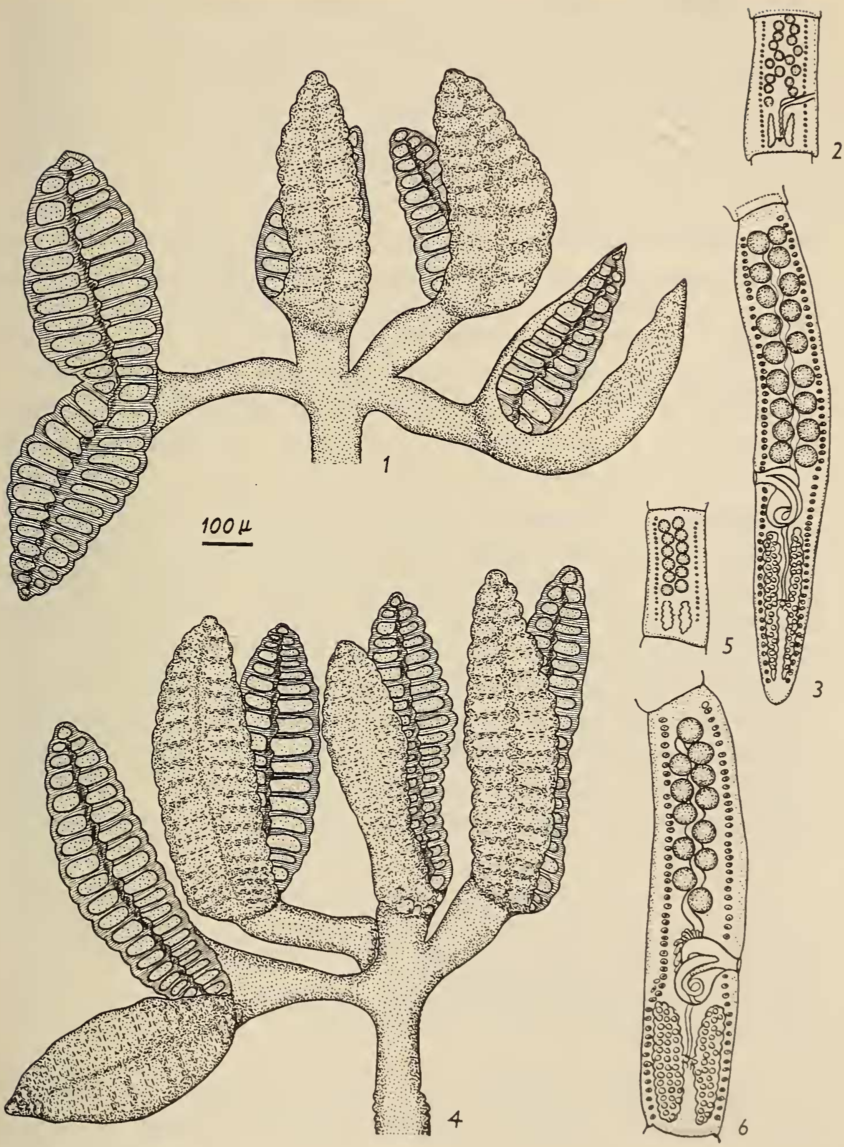
The material had previously been identified as *Echeneibothrium flexile.* Eight individuals were examined, the largest being approximately 7 mm in length and 160 μ in greatest breadth. In their anatomy all the specimens agree very closely with *Rhinebothrium flexile* Linton, 1890 as redescribed by BAER (1948) who examined LINTON's type material. Each bothridium (fig. 1), which is about 900 μ in length by 140 μ in breadth is divided into 46 loculi and the number of testes in each segment (figs. 2, 3) varies from 17 to 22. The cirrus pouch is 158 μ in length and 80 μ in breadth. BAER recorded 44 loculi in bothridia measuring 600 to 800 μ by 100 μ, 14 to 18 testes, and a cirrus pouch which is 216 by 126 μ.

SOUTHWELL (1925, 1930), WARDLE and McLEOD (1952) and YOUNG (1956) included *Rhinebothrium walga* (Shipley and Hornell, 1906) and *Rhinebothrium insignia* Southwell, 1911 as synonyms of *Rhinebothrium flexile*, A redescription of *Rhinebothrium walga* by EUZET (1954), however, has shown that it is a valid species possessing 42 loculi in each bothridium and only 4 testes in each segment. BAER (1948) placed *Rhinebothrium insignia* Southwell, 1911 in the genus *Caulobothrium*, which species will be discussed below. No further account of *Rhinebothrium flexile* will be given here as the species was redescribed by BAER (1948).

Rhinebothrium euzeti n. sp.

Synonymy: ? *Echeneibothrium flexile* Yamaguti 1934, *nec* Linton 1890.
Host: *Dasybatis sp.*
Locality: Pearl banks, Ceylon.
Date: 24.9.28.

This account is based on 6 specimens including only two complete strobilas which had previously been determined as



FIGS. 1-3.
Rhinebothrium flexile Linton, 1890.
1. Scolex.
2. Immature segment.
3. Adult segment.

Figs. 4-6.
Rhinebothrium euzeti n. sp.
4. Scolex.
5. Immature segment.
6. Adult segment.

Echeneibothrium flexile. In their anatomy the specimens do not agree with any of the species included in the genus *Rhinebothrium* but they are probably related to *Echeneibothrium urobatidium* of Young (1954) and *Echeneibothrium hui* of Shen Tseng (1933). The largest specimen measures 5 mm in length with a maximum breadth of 160 μ. Each bothridium (fig. 4) is divided into 78 loculi and is 1.5 mm in length by 230 μ in breadth. There are twelve testes (figs. 5, 6) and the cirrus pouch measures 160 μ by 90 μ, the genital atrium being in the posterior half of the segment. This species has probably been described as *Echeneibothrium flexile* by Yamaguti (1934) who stated that there are 10 testes and that " each bothridium bears two longitudinal rows of about 40 loculi ". According to Young (1954) *Echeneibothrium urobatidium* which was found in *Urobatis halleri*, possesses a well marked cephalic peduncle, 38 to 42 loculi in each bothridium and 10 to 12 testes in each segment. *Echeneibothrium urobatidium*, therefore, appears to be distinct from the species under consideration. Shen Tsen (1933) in his description of *Echeneibothrium hui* from *Dasyatis akajei* stated that there were 48 loculi, 12 testes and that the cirrus pouch measures 227 μ in length by 90.8 to 136.2 μ in breadth. In his figure of the genitalia (*loc. cit.*, fig. 12) the genital pore is in the anterior half of the segment. From the above it seems that the species described by Shen Tseng does not agree with that described here. The species found in Southwell's collection, therefore, is regarded as new and is named *Rhinebothrium euzeti* n. sp.

Rhinebothrium burgeri Baer, 1948.

Synonymy: *Echeneibothrium burgeri* (Baer, 1948), Young, 1956.
Hosts: *Dasybatis sp.* and *Trygon sp.*
Locality: Pearl bank and Pedro bank, Ceylon.
Date: 24.9.28.

Previously this material had been determined as *Echeneibothrium flexile.* The four specimens briefly described here agree with the account of *Rhinebothrium burgeri* by Baer (1948). The largest measures 10 mm in length and 274 μ by 140 μ in greatest breadth. Each bothridium, which is about 900 μ by 140 μ, is divided into 50 loculi (fig. 7). There are 30 to 34 testes in each segment (figs. 8, 9) and the cirrus pouch measures 270 μ by 95 μ.

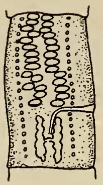
A characteristic feature of the present specimens is that the genital atrium appears very muscular. BAER recorded a length of 8 mm for *R. burgeri*, the bothridia measuring 1 mm by 160 μ with 48 to 50 loculi, 30 to 35 testes and a cirrus pouch 280 μ in length by 104 μ in breadth. YOUNG (1956) placed *R. burgeri* in the genus *Echeneibothrium.*

Rhinebothrium trygonis (Shipley and Hornell, 1906).

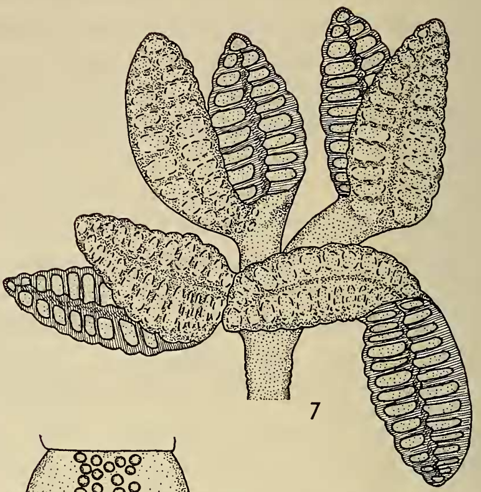
Synonymy: *Echeneibothrium trygonis*, Shipley and Hornell, 1906.
Rhinebothrium shipleyi Southwell, 1911.
Echeneibothrium minimum Southwell 1925 *pro parte nec* Van. Ben. 1850.
Echeneibothrium shipleyi (Southwell, 1911), Young 1956.
Host: *Trygon kuhli.*
Locality: Ceylon.
Date: 17.12.23.

Twenty four specimens have been examined. This material had been identified previously either as " *Echeneibothrium variable* " or " *Echeneibothrium minimum* " = *Rhinebothrium shipleyi* ". At first the writer was also inclined to segregate this material into two species, namely *Rhinebothrium trygonis* (Shipley and Hornell, 1906) and *R. shipleyi* Southwell, 1911 on account of the variation in the form of the scolex (figs. 8, 11), in the size of the cirrus pouch, in the number of testes and in the extent of the vitellaria (figs. 9, 10, 11, 13). These differences, however, may be a matter of development, which together with varying degrees of contraction would result in different arrangements of the male and female genitalia. They may also be due to different infestations, a multiple infestation resulting in small individuals, each with a scolex possessing weakly developed loculi (fig. 8) whereas a single infestation could result in a worm with strongly developed loculi (fig. 11). At present, therefore, it is considered that the material examined really consists of one species, namely *Rhinebothrium trygonis.* An examination of a large number of individuals, however, including living specimens is necessary either to confirm or disprove this point of view.

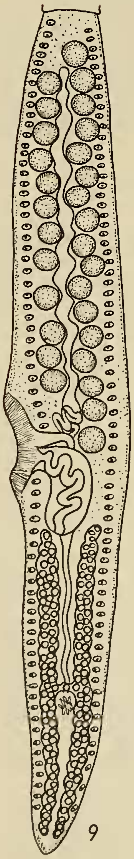
SHIPLEY and HORNELL (1906) in their original description of *R. trygonis* stated that " On the inner face of each bothridium are seven or eight areolas which stretch across the bothridium and thus there is no median longitudinal line ". The specimens discussed



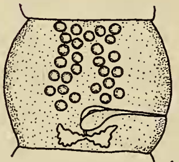
8



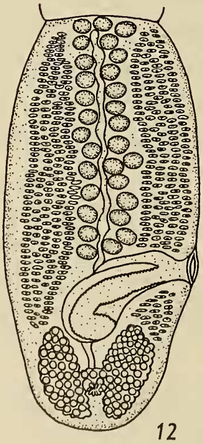
7



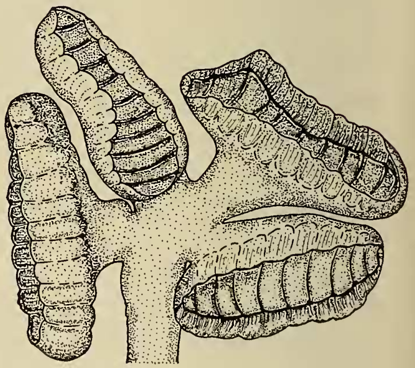
9



11



12



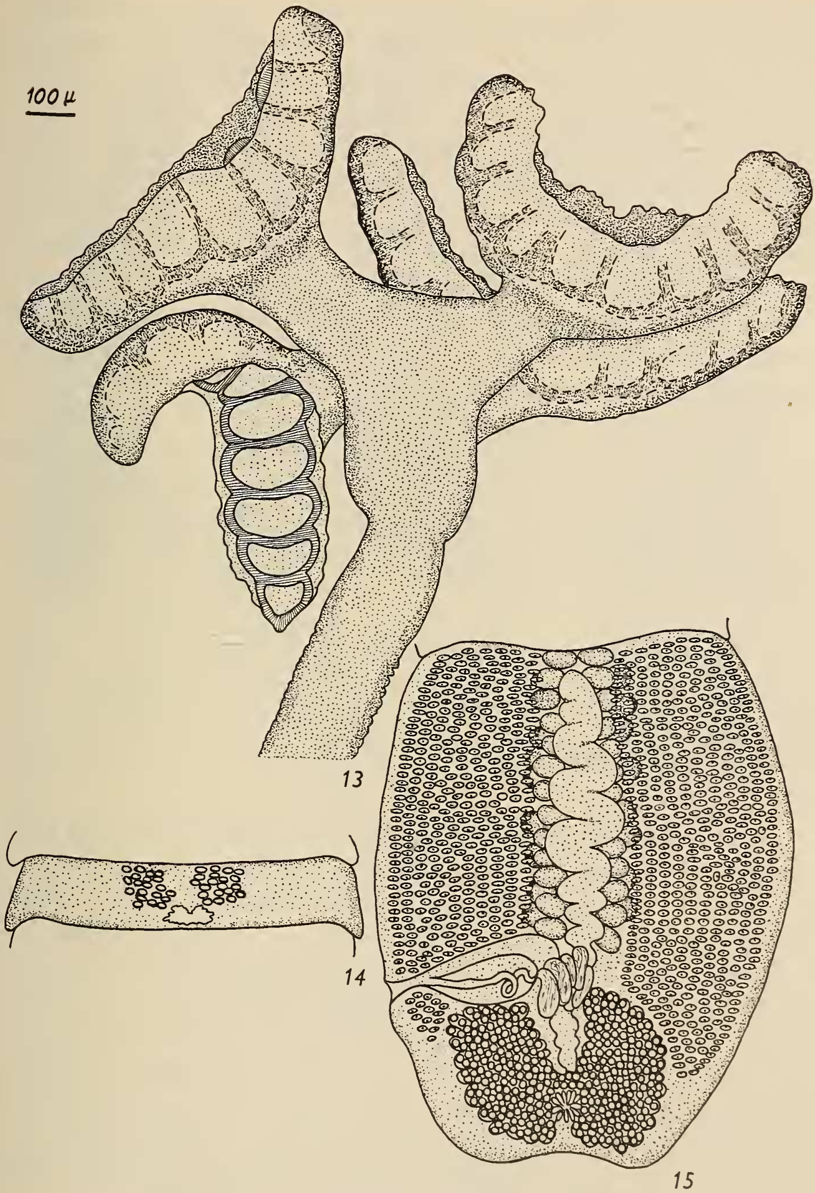
10

Figs. 7-9.
Rhinebothrium burgeri
Baer, 1948.

7. Scolex.
8. Immature segment.
9. Adult segment.

Figs. 10-12.
Rhinebothrium trygonis
(Shipley and Hornell, 1906).

10. Scolex.
11. Immature segment.
12. Adult segment.



Figs. 13-15.

Rhinebothrium shipleyi (Shipley and Hornell, 1906).

13. Scolex.
14. Immature segment.
15. Adult segment.

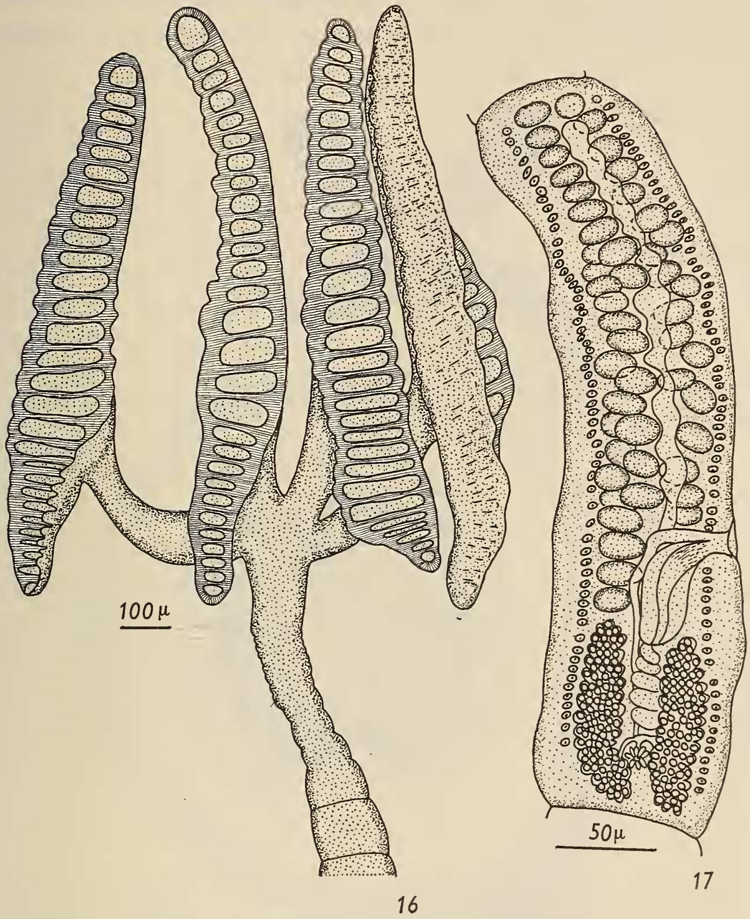
here possess a single row of 10 to 12 loculi whereas Southwell (1912) in his description of *R. shipleyi*, now placed as a synonym of *R. trygonis*, recorded 10 loculi. Yamaguti (1934) gave a redescription of *R. trygonis* as *R. shipleyi.* He recorded 10 loculi, 40 testes and a maximum length and breadth of 20 mm and 0.67 mm respectively in mature specimens. In the specimens examined the lengths of mature specimens varied from 20 mm to 45 mm, the breadth from 0.5 mm to 1 mm and the number of testes from 30 to 40. The cirrus pouch measures up to 322 μ in length by 159 μ in breadth and may or may not extend backwards between the lateral wings of the ovary as far as its transverse limb. In Yamaguti's specimens the cirrus pouch measures 400 μ by 240 μ.

Wardle and McLeod (1952) wrongly regarded " *R. shipleyi* " as a synonym of *R. minimum* (Beneden, 1850) but Young (1956) accepted the species and placed it in the genus *Echeneibothrium.* A recent redescription of *R. minimum* by Euzet (1954) from *Trygon pastinaca* has shown that it possesses 11 loculi but only 4 testes.

Rhinebothrium rankini Baer, 1948.

Synonymy: *Echeneibothrium rankini* (Baer, 1948), Young, 1956.
Host: *Dasybatis sp.*
Locality: Pearl banks, Ceylon.
Date: 24.9.28.

Five specimens were available for examination, they had been identified previously as " A species of *Echeneibothrium* allied to *E. minimum* ", " *A new species of Echeneibothrium* " and as " *Echeneibothrium flexile* ". The largest measures 5 mm in length and its greatest breadth is 110 μ. Each bothridium which is divided into 28 loculi is about 1.4 mm in length and 110 μ in maximum breadth (fig. 16). There are about 50 testes and the cirrus pouch measures 225 μ by 114 μ (fig. 17). The specimens, therefore, correspond with the description of *R. rankini* by Baer (1948) except for a difference of five in the number of loculi. Young (1956) was probably in error in considering *Rhinebothrium rankini* and *R. shipleyi* Southwell, 1912 as identical. This latter species is valid and discussed above as *R. trygonis* (Shipley and Hornell, 1906). *R. rankini* is probably related to *R. monodi* Euzet, 1954 from *Taeniura grabata.* It possesses 60 to 80 testes and 17 loculi.

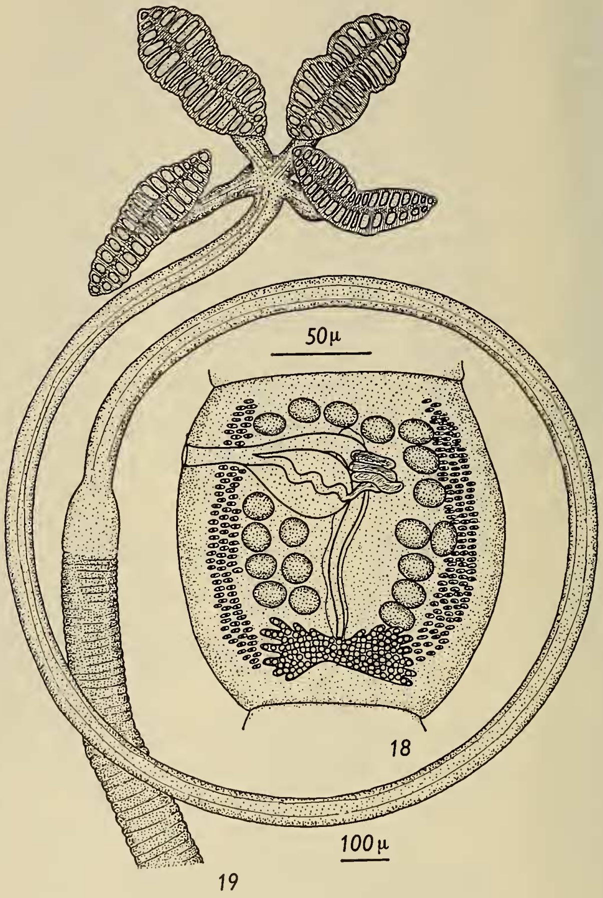


Figs. 16-17.
Rhinebothrium rankini Baer, 1948.
16. Scolex.
17. Adult segment.

Caulobothrium insignia (Southwell, 1911), Baer 1948.

Synonymy: *Rhinebothrium insignia* Southwell, 1911.
Echeneibothrium flexile Southwell, 1925, *nec* Linton, 1890.
Echeneibothrium insignia (Southwell, 1911), Young, 1956.
Hosts: *Trygon kuhli* or *Trygon walga.*
Locality: Ceylon.
Date: November 1910.

Four specimens which had been identified previously as *Rhinebothrium flexile* have been re-examined and as a result *Rhinebothrium insignia* Southwell, 1911 is re-established as a valid species. Southwell (1925, 1930), Wardle and McLeod (1952) and Young (1956) placed the species as a synonym of *Rhinebothrium flexile* Linton, 1890 which was redescribed by Baer (1948). This latter author showed the presence of 14 to 18 testes in each segment



Figs. 18-19.
Caulobohrium insignia
18. Adult segment.
19. Scolex.

and 46 loculi in each bothridium of *Rhinebothrium flexile*. *Rhinebothrium insignia*, however, possesses 18 to 26 testes (fig. 18) and 34 loculi (fig. 19). The species was placed in the genus *Caulobothrium* by BAER (1948) in view of its long cephalic peduncle which measures 6 to 7 mm in length, and the presence of testes between the cirrus pouch and ovary on the side of the genital pore. It is of interest to state that YOUNG (1956) regarded *Caulobothrium* as a synonym of the genus *Echeneibothrium* and wrongly regarded *Caulobothrium insignia* as a doubtful species while RISER (1955) retained the genus and described two new forms namely, *Caulobothrium tetrascaphium* and *C. opisthorchis*.

No further account of *C. insignia* will be given here as SOUTHWELL (1911, 1925) has given descriptions of the species, the observations on the present specimens agreeing with his accounts.

ACKNOWLEDGEMENTS

I am indebted to Professor J. G. BAER who allowed me to investigate some of SOUTHWELL's material at the Zoological Institute, University of Neuchâtel and for his invaluable assistance and advice. The Department of Scientific and Industrial Research, Great Britain made the investigation possible by giving generous financial aid.

REFERENCES

BAER, Jean-G. 1948. *Contribution à l'étude des Cestodes de Sélaciens I-IV.* Bull. Soc. neuch. Sci. Nat. 71: 63-122. 74 fig.

EUZET, L. 1953. *Cestodes Tétraphyllides nouveaux ou peu connus de Dasyatis pastinaca (L).* Ann. Parasit. 28: 339-351. 7 fig.

— 1954. *Parasites de Poissons de mer ouest-africains récoltés par J. Cadenat.* Bull. IFAN 16: 126-138. 6 fig.

RISER, N. W. 1955. *Studies on Cestode Parasites of Sharks and Skates.* Jnl. Tenessee Acad. Sci. 30: 265-311. 69 fig.

SHIPLEY, A. E. and J. HORNELL. 1906. *Cestode and Nematode parasites from the marine fishes of Ceylon.* Report on the Pearl Oyster Fisheries. Part V. 43-96. 118 fig.

SOUTHWELL, T. 1911*a*. *Description of nine new species of cestode parasites, including two new genera from marine fishes of Ceylon.* Ceylon Marine Biological Reports. Part V, 216-217. 35 fig.

SOUTHWELL, T. 1912. *A description of ten new species of cestode parasites from marine fishes of Ceylon, with notes on other cestodes from the same region.* Ibid. Part VI, 259-278. 43 fig.

— 1925*b*. *A monograph on the Tetraphyllidea with notes on related cestodes.* Liverpool School of Tropical Medicine Memoir (New Series) 2: 1-368. 243 fig.

— 1930. *Cestoda.* Fauna of British India including Ceylon and Burma. 1: i-xxix+391 pp. 221 fig., 1 map.

TSENG, Shen. 1933. *Study on some cestodes from fishes.* Jnl. Sci. Nat. Univ. Shantung. Tsingtao 2: 1-21. 21 fig.

WARDLE, R. A. and J. A. MCLEOD. 1952. *The Zoology of Tapeworms.* Minneapolis, 1-780. 419 fig.

YAMAGUTI, S. 1934. *Studies on the Helminth Fauna of Japan. Part 4. Cestodes of Fishes.* Jap. J. Zool. 4: 1-112. 187 fig.

YOUNG, R. T. 1955. *Two new species of Echeneibothrium from the stingray, Urobatis halleri.* Trans. Amer. Micr. Soc. 74: 232-234. 7 fig.

— 1956. *A review of the cestode genus Echeneibothrium.* J. Wash. Acad. Sci. 46: 256-265.